

POROUS FILM AND METHOD FOR PREPARATION THEREOF

DETAILED ACTION

Response to Amendment

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
2. Any rejections stated in the previous Office Action and not repeated below are withdrawn.
3. It is noted that independent claim 1 has been amended to include the limitations of previously presented dependent claim 14. Previously presented claim 14 has been cancelled. Claims 3-4, 6, and 13 were previously withdrawn without traverse.
4. No new rejections have been made over previously rejected claims. For this reason it is proper to make the present action FINAL.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-2, 5, 7-10, 12, and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Minegishi et al. (US 2003/0094409) and further in view of Ross et al. (US 6,521,690).

7. Minegishi et al teach a process for preparing a hollow fiber membrane comprising discharging a polyvinylidene fluoride (PVDF) resin in a poor solvent at a temperature above phase separation temperature and then cooling the liquid raw material (paragraph [0010]). Minegishi et al. further teach that the polymer solution is cooled from a temperature above the phase separation temperature in the range of 80°C to 175°C by cooling liquid, meaning the PVDF/poor solvent solution is above 170°C and below the thermal decomposition temperature of the PVDF resin. In this process, microspheric structures connect to each other to form a membrane having pores (paragraphs [0023] and [0024]). Examples of poor solvents include dimethyl phthalate (paragraph [0022]). The membrane of Minegishi et al. has pores with an average diameter of from 0.01 to 20 µm, preferably 0.01 to 10 µm (paragraph [0052]), the pore diameter of which overlaps the instantly claimed range (claim 10). Minegishi et al. also teach that membrane has a porosity of from 40% to 75% (See claim 11, US 2003/0094409). Figure 4 of Minegishi et al. further shows a microstructure with a resin phase continuous in a three-dimensional manner with a network structure with irregularly pore spaces between. Paragraph [0032] of Minegishi et al. teaches that inorganic additives are preferably added to the polymer composition.

8. Minegishi et al. teach that additives such as inorganic salts can be added to the membrane (paragraph [0032]), but do not expressly teach that the salts are organized clay such as inorganic silicates, said silicates of which are prepared using alkylene oxide or onium ions.

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9. However, Ross et al. teach a modified clay/polymer composition using a thermoplastic polymer and a smectite clay modified with organic chemicals (column 4, lines 50-52). Ross et al. further teach that the thermoplastic polymer can comprise polyvinylidene fluoride resin (column 10, line 15) and the smectite clay is reacted with one or more ammonium compounds and one or more anionic organic materials before being dispersed into the polymer resin (column 5, lines 34-39). The smectite clay disclosed in Ross et al. can include phyllosilicates which can be assembled into layers (column 5, lines 40-43 and lines 46-49). The ammonium compound can comprise alkoxylated groups such as alkylene oxide (column 6, line 64 - column 7, line 16). The smectite clay may also be modified using a quaternary ammonium salt that contains at least one and preferably two or three hydrocarbon chains having from about 8 to about 30 carbon atoms and which may have hydrophilic radicals and ethylene oxide (column 8, lines 28-34). This satisfies the limitations of instant claim 16.

10. The clays of Ross et al. are ground to a size of less than 325 mesh (less than 44 microns, the size of which overlaps the instantly claimed range). It is well settled that where the prior art describes the components of a claimed compound or compositions in concentrations within or overlapping the claimed concentrations a *prima facie* case of obviousness is established. See *In re Harris*, 409 F.3d 1339, 1343, 74 USPQ2d 1951, 1953 (Fed. Cir 2005); *In re Peterson*, 315 F.3d 1325, 1329, 65 USPQ 2d 1379, 1382 (Fed. Cir. 1997); *In re Woodruff*, 919 F.2d 1575, 1578 16 USPQ2d 1934, 1936-37 (CCPA 1990); *In re Malagari*, 499 F.2d 1297, 1303, 182 USPQ 549, 553 (CCPA 1974).

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11. Claim 15 state properties of the porous film: suppression of the formation of spherical crystal structures within poly(vinylidene fluoride) due to the presence of organized clay. While Ross et al. do not elaborate on the property, Ross et al. teach essentially the same composition: a polymer which may comprise poly(vinylidene fluoride) combined with organized clay. One of ordinary skill in the art would have a reasonable basis to believe the polymer composition of Ross et al. to exhibits essentially the same properties. Since the PTO cannot conduct experiments, the burden of proof is shifted to the applicants to establish an unobvious difference. See *In re Best*, 562 F.2d 1252, 195 USPQ 430 (CCPA 1977).

12. It would have been obvious to one of ordinary skill in the art to use the organized clay compositions of Ross et al. in the process for producing a membrane taught by Minegishi et al. because the compositions both comprise poly (vinylidene fluoride) with inorganic materials. Using the inorganic clay made by Ross et al. in the invention of Minegishi would provide a film which would exhibit improved tensile strength, tensile modulus, gas barrier, and heat distortion temperatures (column 11, lines 14-17). Furthermore, the organized clays are easily dispersed into both polar and nonpolar thermoplastic polymers, the organoclay can be made inexpensively, and their polymers do not need compatibilizers or grafting to allow the organoclay to be dispersed within it (column 4, lines 50-59).

Response to Arguments

13. Applicant's arguments with respect to the rejection of claim 15 under 35 U.S.C. 112, second paragraph have been fully considered and are persuasive. The rejection of claim 15 under 35 U.S.C. 112, second paragraph has been withdrawn.
14. Applicant's arguments with respect to the rejection of claims 1-3, 5, 7-10, 12, 14, and 15 under 35 U.S.C. 103(a) as obvious over Minegishi in view of Ross has been considered but are not persuasive.
15. Applicant argues that no combination of Minegishi and Ross renders the presently claimed invention obvious. Applicant specifically argues that the range of a particle size of less than 325 mesh (44 micron) does not overlap in scope with a range of average particle size of 0.01- 0.3 microns. This is not persuasive.
16. While the distinction made by Applicants regarding the average particle size is appreciated, it is the examiner's position that the scope of the teachings in Ross overlap with the scope of the claimed range. The scope of Ross' teaching of a particle size of less than 325 mesh (44 micron) includes embodiments where ALL the particles are of one size, such as 0.2 microns. When all the particles are one size, such as 0.2 microns, the average particle size must be 0.2 microns. Such an embodiment falls within the scope of the claimed range.
17. Additionally, applicant states on pg. 6 of the Remarks filed 4/19/2010 "the single use teaching of Ross in Example 1 is a teaching of a single average particle size, not a range of average particle sizes that is capable of overlapping with other ranges of particle sizes." However, Ross teaches "less than 325 mesh", which is a range of 325

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mesh and smaller. This range overlaps with the claimed range of 0.01-0.3 microns.

While one of ordinary skill in the art could interpret “less than 325 mesh” as meaning the average particle size is smaller than 325 mesh, it would be reasonable for one of ordinary skill in the art to interpret “less than 325 mesh” as a range meaning the average particle size is any size that is smaller than 325 mesh. Thus, contrary to applicant’s argument, the range taught in Ross overlaps the claimed range.

18. Applicant argues that Ross does not teach any particular reason for using the claimed particle size, nor the importance of any particular particle size. However, as discussed above, the scope of Ross’s teaching of less than 325 mesh (44 micron) includes embodiments where ALL the particles are of one size, such as 0.2 microns. Furthermore, it is noted that the applicant has failed to provide any evidence of the criticality of the claimed average particle size of organized clay grains. With regards to the applicants’ argument regarding result effective variables, it is noted that the result-effective-variable reasoning was not used in the previous rejection or the rejection above. Rather, the average particle size described in Ross (less than 44 microns) overlaps the instantly claimed average particle size (0.01 to 0.3 microns). While the range disclosed in Ross may be broader than the instantly claimed range, there is no reason that one of ordinary skill in the art would not be motivated to use a smectite clay with ANY average particle size of 44 microns or less, given the teachings of Ross.

19. Applicant further argues that they have shown that use of a hydrophilic organized clay having an average particle size of 0.3 microns or lower provides improved dispersion over particles larger in size. This is not shown. As admitted by the applicant

in the first full paragraph on page 7 of the arguments filed April 19, 2010, the comparative example of the invention comprises no organized clay. Therefore the advantageous properties of the hydrophilic organized clay having an average particle size of 0.3 microns may be due to its mere presence and not due to the average particle size.

20. Furthermore, in response to applicant's arguments against Ross individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Note that while Ross may not disclose all the features of the present claimed invention, Ross is used as teaching reference, and therefore, it is not necessary for this secondary reference to contain all the features of the presently claimed invention, *In re Nievelt*, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973), *In re Keller* 624 F.2d 413, 208 USPQ 871, 881 (CCPA 1981). Rather this reference teaches a certain concept, a smectite clay (average size of 0-44 microns) modified with organic chemicals and used in thermoplastic polymers, and in combination with the primary reference, discloses the presently claimed invention.

21. Applicant argues that Minegishi does not teach what is lacking in Ross. For the reasons provided above, namely that the range of average particle size of the smectite clay of Ross is from 0 to 44 microns and the lack of applicants' evidence of the criticality of the claimed range of particle size of the organized clay, applicants' arguments regarding Ross (6,521,690) are not persuasive.

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22. As discussed in the rejection above, it would have been obvious to one of ordinary skill in the art to use the organized clay compositions of Ross et al. in the process for producing a membrane taught by Minegishi et al. because the compositions both comprise poly (vinylidene fluoride) with inorganic materials. Using the inorganic clay made by Ross et al. in the invention of Minegishi would provide a film which would exhibit improved tensile strength, tensile modulus, gas barrier, and heat distortion temperatures (column 11, lines 14-17). Furthermore, the organized clays are easily dispersed into both polar and nonpolar thermoplastic polymers, the organoclay can be made inexpensively, and their polymers do not need compatibilizers or grafting to allow the organoclay to be dispersed within it (column 4, lines 50-59).

23. Applicants argue that Minegishi teaches away from claim 1 and that Minegishi teaches away from the teachings of Ross et al. Applicant argues that Minegishi teaches the undesirability of using inorganic particles, and the invention of Minegishi avoids using inorganic particles. Applicant points to paragraph [0007] of Minegishi which reads:

The melt extraction process yields a relatively uniform, high-strength membrane with no macrovoids; however, poor dispersion of the inorganic particles can cause defects such as pinholes. Furthermore, the melt extraction process has a disadvantage of extremely high production cost. *Minegishi* at paragraph [0007].

24. Applicants' argument is not persuasive. As noted in the previous office action, it is again emphasized that what the paragraph above teaches is **not that the mere use of inorganic particles** causes pinholes, but rather the **poor dispersion** of said particles which leads to pinholes. Paragraph [0032] of Minegishi et al. teaches that inorganic additives are **preferably** added to the polymer composition (emphasis added).

Therefore, one of ordinary skill in the art would **not** be led by Minegishi to avoid using inorganic particles as asserted by the applicant. Minegishi certainly does not avoid use of inorganic particles based on the above teaching from the reference. In addition, Minegishi very explicitly teaches that "high production cost" is the result of the melt extrusion process and NOT due to the presence of inorganic particles, as asserted in the applicants' arguments (page 8, second full paragraph of the Remarks filed April 19, 2010).

25. Applicant further asserts that addition of the inorganic materials of Minegishi would result in the particles being dissolved rather than dispersed in the stock solution. Applicants argument is not persuasive. No where in Minegishi is it disclosed that the added inorganic material must be dissolved in order to shift the crystallization temperature of the stock solution. Rather, what is disclosed is that inorganic (or organic) materials are preferably added to have this effect. Whether the inorganic (or organic) materials are dissolved or dispersed in the solution, the crystallization temperature of the stock solution would be affected.

26. In summary, Minegishi does not teach avoidance of inorganic particles anywhere in the reference. Minegishi does not teach that the inorganic (or organic) materials of paragraph [0032] must be dissolved in order to shift the crystallization temperature of the stock solution anywhere in the reference. Ross et al. teaches a range which overlaps the instantly claimed range for average particle size of the organized clay. Applicant has failed to provide evidence that the instantly claimed range is critical. Therefore, applicants' arguments are not persuasive.

27. Regarding newly presented claim 16, applicant asserts that because Ross teaches the importance of using an organic anion in the clay, Ross teaches away from a claim reciting that the hydrophilic compound is selected from the group consisting of an onium ion-containing compound and an alkylene oxide containing compound.

28. Applicants' argument is not persuasive. Stressing the importance of an organic anion does not teach away from an onium ion containing compound. Ross teaches that the smectite clay (which may have a particle size from 0 to 44 microns) is modified by addition of alkoxylated groups containing 1 to 80 moles of alkylene oxide, which in itself satisfies instant claim 16. See column 7, lines 1-16. As discussed in the rejection above, the smectite clay may also be modified using a quaternary ammonium compound comprising a quaternary ammonium salt that contains at least one and preferably two or three hydrocarbon chains having from about 8 to about 30 carbon atoms and which may have hydrophilic radicals and ethylene oxide(column 8, lines 28-34). This describes, exactly, the limitation of instant claim 16, a hydrophilic compound which is selected from the group consisting of an organic onium-ion containing compound and an alkylene oxide-containing compound. Therefore, Ross does not teach away from instant claim 16, and applicants' argument is not persuasive.

Conclusion

29. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

30. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KARA NEGRELLI whose telephone number is (571)270-7338. The examiner can normally be reached on Monday through Friday 9:30 am EST to 6:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on (571)272-1302. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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